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Hepaticae Africanae novae in insulis Bourbon, Maurice et Madagascar lectae.

F. STEPHANI.

(WITH PLATES XVII–XIX.)

1. **Aneura comosa** ST. *n. sp.*

Dioica, pallide-flavicans, super muscos in plagas latas expansa; *frons* usque ad 7 cm. longa, 2 mm. lata, parum breviterque radicans; laciniae primariae furcatae, furcis irregulariter, superne dense pinnatis raro bipinnatis, pinnulae ultimae trunco triplo angustiores brevissimae; perfecte plana, ubique fere 6 cell., margine autem 3 cell. alta. *Cellulae* corticales 0.1 mm. longae, in sectione transversali 0.035 mm. latae, 0.017 mm. altae; cellulae internae frondis multo majores, in sectione 0.050: 0.070 mm. pellucidae fere vacuae, parietibus haud incrassatis.

Flores feminei numerosi, in pinnulis parvis primariis singuli vel—hac pinnula furcata, geminati; ramulus femineus brevis, naviculiformis i. e. superficie oblonga plana apice rotundata subtus valde incrassatus, marginibus parum elevatis; squama dorsalis fere nulla, ut margo ramuli ciliis longis comatis fimbriata; pistilla itaque omnino occulta et ramuli aeque obvelata.

Ciliae ceterum unicellulares et haud radicantes; facies postica ramuli tamen radicellis veris villosa et muscis arcte affixa.

Bourbon. leg. Rodriguez.

2. **Aneura longispica** ST. *n. sp.*

Dioica, dense depresso-caespitosa, mediocris, triste viridis. *Frons* procumbens, convexo-plana, hic illic radicans, ramis primariis angustis 0.37 mm. latis 2–3 cm. longis, irregulariter pinnatis, pinnulis latioribus (0.85 mm.) inaequilongis simplicibus vel furcatis, raro pinnulatis. Cellulae corticales internis aequimagnae. *Flores femineos* haud vidi; *calyptra* 0.57 mm. lata, 1.7 mm. longa, ad basin pinnularum majorum, e basi angusta quasi stipitata ovata, superne tuberculosa, mamilla apicali majuscula.

Androecia in pinnulis numerosa saepe regulariter pinnatim

disposita, longissima 1.5–2 mm. longa, margine erecto crenulata, antheris biseriatis 14–20 jugis.

Bourbon. leg. Rodriguez. Boivin.

3. **Aneura nudiflora** St. *n. sp.*

Dioica, flavo-virens, humilis, subcaespitosa, minor. *Frons* e caudice repente procumbens, ramis primariis brevibus subdigitatim partitis, longioribus regulariter pinnatis, pinnulis approximatis subaequalibus linearibus, apice *cuspidatis;* basis pinnularum in diametro 16 cell. lata, quarum tres marginales in utroque latere, in medio 4 cell. margine 1 cell. crassa. Cellulae corticales medianae valde elongatae (0.1 : 0.035 mm.). *Ramulus femineus* ad basin ramorum brevissimus, supra subplanus, subtus parum convexus, marginibus pellucidis tenuibus, pulchre laxeque reticulatis, irregulariter profundeque inciso-laciniatis, adscendentibus vel parum incurvis, pistilla itaque perfecte nuda.

Bourbon. leg. Rodriguez.

Facile distinguenda configuratione ramuli ♀ pinnulisque attenuatis!

4. **Aneura saccatiflora** St. *n. sp.*

Monoica, pallide-flavicans, dense depresso-caespitosa; *frons* procumbens, stolonifera, uno latere pinnulis brevibus, altero ramulis majoribus adscendentibus obsita, in sectione plus duplo latior quam alta, biconvexa; ramuli ad basin angusti superne multo latiores, dense pinnati, plani, marginibus decurvis, tenues i. e. in sectione 4 cellulas solum crassi, quarum 2 interiores multo majores. Pinnulae dense et apice ramorum fasciculatim dispositae, valde concavae apicibus incurvis, triplo angustiores quam ramuli, inaequilongae, lineares, distinctius costatae, costa dimidium pinnulae latitudinis occupans, marginibus 3 cell. latis, 1 cell. crassis.

Flores feminei in trunci pinnulis brevibus valde numerosi, saepe utroque latere regulariter seriati, ramulus ♀ brevis, postice tumidissimus fere saccatiformis, superficie descendente (fere verticali in planta horizontali) margine irregulariter inciso filisque laxe cellulosis dense fimbriato; squama dorsalis brevis, paucidentata.

Calyptra e basi angustiore obovata, dimidio supero cellulis squamisque laxe cellulosis hirta, vertice fasciculo cellularum similium coronato; basi 5 cell. superne 3 cell. crassa.

Androecia ramulis femineis approximata, primo breves curvata et sub fronde occulta, dein elongata porrecta, antheridiis 6–8 jugis, marginibus papulosis.

Bourbon. leg. Rodriguez.

5. **Chiloscyphus grandistipus** St. *n. sp.*

Dioica, pallide-virens, major, muscis irrepens. *Caulis* 4–5 cm. longus vage pauciramosus arcte repens. *Folia* dense imbricata, opposita fere recte patentia, ovata, apice truncata, tri–quadri-spinosa, in medio marginis ventralis spina quarta solitari munita, dorso breviter decurrentia coalita. Cell. 0.035 mm. basi 0.035 : 0.050 mm., trigonis subnullis.

Amphigastria magna, caule fere quintuplo latiora, foliis utroque latere distincte coadunata, circumscriptione reniformia, profunde sinuatim inserta, apice lunatim excisa longeque bispinosa, lateribus varie dentatis spinosisque.

Singulum ramulum ♀ junius in axilla amphig. inveni.

Bourbon. leg. Rodriguez.

6. *Taxi-Lejeunea conformis* N. & M.

Monoica, pallide-virens, flaccida, minor; caulis 3–4 cm. longus, vage multiramosus. *Folia* parum imbricata ovata breviter acuminata, acuta rare apiculata, fere recte patentia, plana, *lobulo* vel nullo vel caule duplo latiore, leniter inflato, carina arcuata sinuatim in folii marginem excurrens, oblique truncatus, angulo acuto. *Cell.* apice 0.017 mm. medio 0.017 : 0.035 mm., basi 0.025 : 0.035 mm. incrassatio angulosa nulla. *Amphig.* caule quadruplo latiora reniformi-rotunda, basi breviter decurrentia ad $\frac{1}{3}$ incisa, rima angusta, laciniis acutis. *Perianthia* pseudolateralia i. e. uno latere innovata, clavata superne 5 plicata plicis humilibus inermibus, rostro brevissimo; *folia floralia* caulinis parum angustiora hic illic dente obtuso munita, lobulo minimo plicaeformi (semper?). *Amph. involucrale* foliis suis brevius, ovatum ad $\frac{1}{3}$ trifidum, rima angusta, laciniis acuminatis acutis. *Androecia* parva in trunco primario lateralia, bracteis 3 jugis.

Bourbon, *Maurice* et *Madagascar*, communis, semper inter muscos adscendens.

Species bene distincta, in pag. 355 Synops. Hepat. descripta (sine perianthio).

7. **Eu-Lejeunea ecarinata** St. *n. sp.*

Monoica, pallide-flavescens, in cortice dense stratificata. *Caulis* vage multiramosus, ramis simplicibus superne dense breviterque pinnatis. *Folia* dense imbricata, ovata oblique patentia concaviuscula, *lobulo* majusculo caule fere duplo latiore, ovato inflato apice oblique truncato, carina valde arcuata recto angulo in folii marginem transeunte. *Cell.* apice 0.012 mm., medio 0.017 mm., basi 0.025 mm., trigonis majusculis acutis. *Amphig.* magna, caule triplo latiora, transverse

inserta fere circularia, ad medium bifida rima angusta obtusa laciniis acutis.

Perianthia pseudolateralia longe exserta pyriformia inflato-ecarinata, longerostrata. *Folia floralia* caulinis multo minora, erecta oblonga, acuta, perianthio accumbentia profunde complicato-biloba, lobo duplo breviore oblongo-triangulari acuto; *amph. involucrale* anguste-oblongum, ad $\frac{1}{3}$ acute incisum, lobis lanceolatis acutis, foliis suis alte connatum.

Androecia parva cauligena, globosa, bracteis bijugis.

Madagascar. leg. Camboué.

Perianthio ecarinato facile distinguenda, proxima *Lej. cyathophorae* Spruce.

8. **Cheilo-Lejeunea Kurzii** St. *n. sp.*

Monoica, minor, fusco-olivacea, dense depresso-caespitosa. *Caulis* 2 cm. longus, multiramosus, ramulis dense pinnatis. *Folia* parum imbricata fere recte patentia, late semicordata rotundata, concaviuscula, *lobulo* triplo breviore, parum inflato, fere rectangulari, carina leniter arcuata, sinuatim in folii marginem excurrens. *Cell.* apice 0.008 mm., reliquae 0.017 mm. regulariter hexagonae, parietibus aequaliter incrassatis, valde chlorophylliferae.

Amph. caule plus duplo latiora, basi cuneata, transverse inserta, ovata, ad medium bifida, rima angusta, laciniis obtusis, margine laterali angulatis.

Perianthia pro planta magna, pseudolateralia, compresso-pyriformia, 5 carinata carinis posticis humilibus usque ad basin fere decurrentibus, rostro parvo; *folia floralia* caulinis aequimagna, falcatim patula, lobulo breviore angusto; *amph. involucrale* ovatum, ad medium bifidum, rima angusta, lobis obtusis.

Androecia cauligena, oligophylla.

Bourbon. leg. Rodriguez: planta originalis a celeb. Kurz in insulis Nicobaribus anno 1875 lecta et in museo Vindobonensi asservata est.

9. **Cerato-Lejeunea mascarena** St. *n. sp.*

Monoica, fusco-brunnea, laxe caespitans. *Caulis* 3–4 cm. longus, vage ramosus. *Folia* imbricata, falcato-ovata, acuta vel apiculata, rarissime obtusa vel bidentula, adultiora concava, juniora valde decurva vel revoluta, in statu explanato recte patentia. *Cellulae* regulariter hexagonae pellucidae, apice 0.012 mm., medio 0.017 mm., basi 0.035 mm., angulis medioque parum incrassatae. *Lobulus* parvus, caule vix aequilatus, e basi ovata inflata apicem versus duplo angustior, oblique truncatus angulo acuto. *Amphig.* contigua,

maxima, caule 7-plo latiora, cordiformia vel (adulta) reniformi-rotunda, cauli appressa alis decurvulis, ad $\frac{1}{3}$ incisa, rima angusta laciniis acutis.

Perianthia parva, in ramulis pseudolateralia, e basi angusta obovata quadricornuta, cornubus perianthio duplo brevioribus angustis, ventralibus strictis dorsalibus deorsum curvatis, rostro longiusculo. *Folia invol.* caulinis minora, e basi angusta obovata superne irregulariter grosse dentata, lobulo magno lanceolato acuminato apice acuto vel bifido. *Amph. involucrale* foliis suis aequimagnum spathulatum, ad $\frac{1}{3}$ anguste incisum, laciniis conniventibus parce dentatis.

Androecia parva, cauligena, bracteis bi–trijugis.

Bourbon, *Maurice*. leg. Rodriguez.

Proxima *Lej. Belangerianae*, quae differt amph. multo minoribus subtransverse insertis perianthiis majoribus cornubus longis divaricatis, etc.

10. **Cerato-Lejeunea mauritiana** St. *n. sp.*

Monoica, fusco-badia. *Caulis* 3–4 cm. longus pauciramosus, pinnulis microphyllis. *Folia* imbricata, recte patentia, late semicordata subplana, apice rotundata, *lobulo* inflato ovato apicem versus angustato oblique truncato, carina arcuata plus minus profunde sinuatim excurrente. *Cell.* apice 0.012 mm., reliquae 0.025 mm., basi ocellum singulum 0.025 : 0.050 mm. *Amph.* foliis duplo minora caule 6-plo latiora, cordiformia, sinuatim inserta ad $\frac{1}{2}$ bifida, rima angusta laciniis obtusis.

Perianthia pseudolateralia longe exserta, pyriformia 4 carinata, carinis inflatis; cornua erecta angusta, parum divergentia, perianthio triplo breviora; *folia floralia* caulinis multo minora ovata vel oblonga, apiculata vel acuminata subdenticulata, profunde complicato-biloba, lobulo magno, duplo breviore triangulari; *amph. involucrale* foliis suis duplo minus, oblongum subdenticulatum ad $\frac{1}{3}$ bifidum sinu angusto laciniis obtusis. *Androecia* cauligena, bracteis 2–3 jugis.

Maurice. leg. Rodriguez.

11. **Lopho-Lejeunea multilacera** St. *n. sp.*

Monoica, rufescens, mediocris, muscis irrepens. *Caulis* multipartitus, ramis pinnatis, pinnulis inaequilongis recte patentibus. *Folia* imbricata, ovata, recte patentia, acuminata, integerrima vel apice paucidenticulata, acuta, valde recurva, *lobulus* caule duplo latior, basi maxime inflatus, carina itaque valde arcuata abrupte in folii marginem excurrens, oblique truncatus, angulo acuto. *Cell.* apice 0.008 mm., margine 0.017 mm., reliquae 0.025 mm., trigonis majusculis acutis.

Amph. foliis aequimagna, reniformia, profunde sinuatim inserta, concava, apice recurvo.

Perianthia compresso-turbinata, 4 carinata, carinis alte cristatis, cristis grosse lobatis dentatisque; *folia floralia* intima caulinis similia duplo majora, lobulo magno duplo breviore, anguste rectangulari angulo obtuso. *Amph. perich.* e basi cuneata fere orbiculatum, integerrimum, convexum apice tamen recurvatum. *Androecia* in medio ramo, bracteae 7–8 jugae, laxe dispositae, foliis caulinis similes, lobulo magno duplo minore parum inflato recte truncato obtuso.

Bourbon. leg. Rodriguez.

Proxima *Lej. adplanatae*, quae differt foliis apiculatis, foliorum cellulis multo majoribus amphigastrio involucrali grosse dentato et perianthii carinis multo minus laceratis.

12. **Acro-Lejeunea parviloba** St. *n. sp.*

Dioica, robusta, fusco-olivacea, dense depresso-caespitosa. *Caulis* 5–6 cm. longus, multiramosus, ramis remote pinnatis, pinnulis brevibus. *Folia* dense imbricata, semicordato-ovata, apice rotundata, fere recte patentia leniter falcata, *lobulo* triplo breviore, basi inflato, apicem versus angustato oblique truncato (angulo acuto), longe in folii marginem recurvum excurrente, carina leniter arcuata. *Cell.* marg. 0.008, reliquae 0.012 : 0.025 mm., trigonis majusculis acutis. *Amph.* caule triplo latiora, basi sinuatim inserta, cuneato-rotunda, plana, appressa.

Flores feminei in ramulis brevibus terminales; *folia floralia* caulinis aequimagna apiculata vel obtusa, lobulo triplo breviore, angusto-rectangulari, plano; amph. involucrale oblongum, foliis suis parum brevius, apice acuminato brevifissum, rima angusta laciniis lanceolatis acutis.

Androecia desunt.

Maurice. leg. Rodriguez.

13. **Cerato-Lejeunea Renauldii** St. *n. sp.*

Monoica, rufo-brunnea, in Radula repens. Caulis vage ramosus. *Folia* imbricata, subrecte patentia, integerrima, plana late ovata, obtusa dorso caulem haud superantia; *cellulae* pellucidae apice 0.017 mm. reliquae 0.017 : 0.035 mm. angulis medioque parum incrassatae; *lobulus* parvus inflatus, oblongus, oblique truncatus, angulo obtuso, saepe ad plicam parvam triangularem reductus. *Amph.* minora, caule 3-plo latiora, remote appressa, cordiformia, subtransverse inserta, ad medium bifida, rima angusta, laciniis obtusis.

Perianthia magna, foliis caulinis longiora, medio infero urnaeformia quadrangularis supero in 4 alas abrupte dilatata,

alae ovato-triangulares, rotundatae, lateraliter patulae, superne ad perianthii orificium erostratum angustatae. *Folia floralia* caulinis minora, integerrima, ovata acutiuscula, lobulo triplo minore lanceolato integro; *amph. invol.* foliis suis aequimagnum ovatum ad ⅓ obtuse incisum, laciniis obtusis.

Androecia parva, bracteis bijugis.

Bourbon. leg. Rodriguez.

Pulcherrima planta, perianthio curiosissimo facile cognoscenda.

14. **Lepidozia Stephanii** Renauld. *n. sp.*

Dioica, rufescens, minor, gracillima, muscis intermixta. *Caulis* filiformis 3–4 cm. longus, remote breviterque pinnatus, ramis longioribus posticis, pinnulae nusquam attenuatae. *Folia* remota, minuta, fere semiamplexicaulia, ad ¾ trifida, laciniae lanceolatae erecto-incurvae aequilongae, *cellulis* uniseriatis (ipsa basi geminatis) constantes. *Amph.* foliis aequalia, segmentis tamen inaequalibus, uno alterove semper majore. *Flores feminei* in ramulis brevibus posticis; *folia involucralia* trijuga, infima squamaeformia, superiora multo majora, intima apice longe ciliata; *perianthia* (juniora solum visa) ore dense longissimeque ciliata.

Maurice. leg. Rodriguez.

Proxime accedit ad *Lepidoziam verrucosam* Steph. quae differt foliis verrucosis, perianthii ore brevifisso, foliis floralibus dentatis.

15. **Lophocolea borbonica** St. *n. sp.*

Dioica, olivacea, depresso-caespitosa, minor. *Caulis* 2 cm. longus, vage multiramosus. Folia inferiora minima, patula, cauli aequilata, lunatim emarginata, superiora multo majora, adscendentia, homomalla, ovata, ad ⅓ emarginata, lobis acuminatis porrectis. *Cell.* 0.025 mm. trigonis majusculis in margine irregulariter prominentes. *Amph.* patentissima, inferiora libera, superiora uno latere folio coadunata, altero interdum cum lamina angusta in caule longe decurrente folio connata.

Perianthia innovata, obovato-triquetra, ad ½ triloba, lobis apice bifidis grosse tri–quadridentatis; folia floralia caulinis similia, majora, perianthio appressa; amph. invol. intimum ovatum foliis suis triplo brevius, ad ¼ emarginatum, laciniis acuminatis.

Androecia ignota.

Bourbon. leg. Rodriguez.

16. **Lophocolea inflata** St. *n. sp.*

Dioica, dense depresso-caespitosa, rufescens major.

Caulis 3–4 cm. longus, pauciramosus. *Folia* dense imbricata, subopposita, subquadrata saepe convexa, marginibus revolutis, margine ventrali parum arcuata, dorsali stricta apice truncata, 3–4 spinosa, spinis longe setaceis strictis divaricatis, dorso libera ventre uno vel utroque latere amphigastrio coalita; cell. 0.035 mm. trigonis majusculis acutis. *Amph.* remota, cauli appressa, apice lunatim emarginata, laciniis divaricatis setaceis, basi utroque latere dente spiniformi munita, in foliis plus minus distincte decurrentia.

Perianthia haud innovata, maxima, ovato inflata vix triquetra, haud alata, ad $\frac{1}{3}$ tripartita, lobis late linearibus apice recte truncatis denseque spinuliferis vel parce fimbriatis. *Folia involucr.* intima vaginatim amplectentia, quadrato-rotunda, apice patula trispinosa uno alterove dente in margine ventrali. *Amph. invol.* intimum caulinis majus, liberum, ovatum ad $\frac{1}{3}$ bifidum, laciniis lanceolatis porrectis basin versus paucispinosum.

Androecia ignota.

Bourbon. leg. Rodriguez.

Proxima *Loph. triacanthae* H. & T., quae differt foliis apice distincte angustatis.

17. **Lophocolea longifolia** St. *n. sp.*

Dioica, inter muscos crescens, pallide-virens. *Caulis* 2–3 cm. longus, in specimine unico solum innovato-ramosus ceterum simplex. *Folia* heteroformia, inferiora contigua minora, plano-disticha, ligulata late breviterque emarginata vel incisa, lobulis inaequalibus obtusis vel rotundatis; superiora remotiuscula sensim majora pro more plus duplo longiora quam lata, fere linearia, breviter lunatim emarginata, lobis acutis margine ventrali recurvo. *Cell.* 0.025 mm. (basi 0.020 : 0.035 mm.) trigonis parvis. *Amph.* libera, patula, cauli aequilata basi cuneata, profunde emarginata, laciniis divaricatis, extus unidentatis. *Perianthia* terminalia, semper innovata, turbinata ad $\frac{2}{3}$ trifida, laciniis apice profunde bifidis, marginibus remote grosseque spinosis, ala nulla; *folia floralia* intima oblonga ad $\frac{1}{4}$ acute incisa, lobis inaequalibus obtusis; *amph. invol.* intimum obovatum, extus angulatum, ad $\frac{1}{3}$ obtuse incisum, laciniis longe acuminatis hamatis.

Androecia ignota.

Bourbon. leg. Rodriguez.

18. **Lophocolea rubescens** St. *n. sp.*

Monoica, major, flavo-virens, apicibus rubescentibus. *Caulis* 3–4 cm. longus, multiramosus, repens, inter muscos adscendens vel dense caespitosus. *Folia* apposita, plano-

disticha, dense imbricata, ovato-triangularia, margine ventrali parum arcuata, dorsali substricta, apice triplo angustiora, lunatim-emarginata, laciniis inaequalibus acutis, basi dorsali libera ventre amphigastrio connata. *Cell.* marg. 0.025 mm. reliquae 0.045 mm. trigonis nullis. *Amph.* magna, caule subtriplo latiora, ad $\frac{2}{3}$ emarginata, laciniis lanceolatis acutis, extus breviter unidentatis utroque latere foliis late connatis. *Perianthia* haud innovata, obconico-triquetra, apice ad $\frac{1}{4}$ trifida, segmentis profunde emarginato-bifidis, late alata, alis longe decurrentibus irregulariter grosse spinosis; *folia floralia* erecta oblongo-linearia, apice emarginato-bidentata, marginibus paucidentatis.

Amph. invol. intimum subquadratum concavum, emarginato-bidentatum, foliis suis late connatum, marginibus paucidentatis, recurvis.

Androecia in ramulis lateralibus terminalia, bracteis 5 jugis, antice inflato-lobatis decurvis, apice emarginato-bifidis ventre amphigastrio magno quadrifido coalitis.

Bourbon. leg. Rodriguez.

19. **Odontoschisma ligulatum** St. *n. sp.*

Sterilis, glaucescens laxe caespitosum in cortice putrido reptans. *Caulis* basi pauciramosus, ramis posticis longioribus arcuatis, simplicibus, iteratim radicantibus. *Folia* parum imbricata, fere recte patentia, adscendentia, plana, ligulata, antice longe decurrentia, postice breviter inserta. *Cellulae* pellucidae, margine 0.025, medio 0.035, basi 0.025 : 0.050 mm. trigonis distinctis cuticula verrucosa. *Amph.* ubique praesentia caule aequilata, triangularia, valde recurva apice bifidula. *Cetera* desunt.

Bourbon. leg. Rodriguez.

20. **Plagiochila Cambuena** St. *n. sp.*

Dioica, fuscescens, minor, rigida, gracilis laxe caespitans. *Caulis* e caudice repente defoliato erectus, strictus, sanguineus simplex vel bifurcatus apice remote pinnatus pinnulis fere recte patentibus strictis. *Folia* decurvo-homomalla dense imbricata valde concava, in plano fere rotunda, antice longe decurrentia, postice valde ampliata, cristato-erecta margineque maxime crispata, ceterum integerrima, margine dorsali anguste recurvo. *Cell.* apicales 0.025, basi 0.025 : 0.035 mm. trigonis magnis acutis. *Amph.* maxima, e basi cuneata late obovata, ad $\frac{3}{4}$ bifida, laciniis irregulariter lobatis crispatis. *Perianthia* compresso-campanulata, ore truncato dense setosa, uno latere alata, ala lata inermi, *folia involucralia*

argute dentata, ut amphigastrium involucrale caulinis simil a, majora. *Androecia* ignota.

Madagascar leg. Camboué.

21. **Plagiochila Rodriguezii** St. *n. sp.*

Dioica, olivacea, dense caespitosa, major. *Caulis* erectus, simplex, apice flabellatim pauciramosus, in plantis floriferis repetito furcatus. *Folia* dense imbricata, oblique patentia (angulo 45°) oblique ovato-oblonga, integra, antice parum decurrentia margine stricto recurvo, postice decurrentia ampliata, margine basin versus recurvo crispatulo, apicem versus plano, apice angustato rotundata vel subtruncata. *Cell.* apic. 0.017 mm. basi duplo longiores, trigonis majusculis. *Flores feminei* axillares i. e terminales utroque latere innovati; folia floralia bijuga, caulinis similia majora remote spinosa. *Cetera* ignota.

Bourbon. leg. Rodriguez.

22. **Plagiochila tenax** St. *n. sp.*

Dioica, fusco-olivacea, laxe caespitosa, tenax robusta. *Caulis* basi pauciramosus, ramis erectis simplicibus. *Folia* dissita, fere recte patentia, rigida, inferiora semiovata, superiora oblongo-linearia, leniter falcata utroque latere parum decurrentia, margine dorsali anguste recurvo, postici magis arcuata basique recurvata, apicem versus et apice ipso paucidentata, dentibus irregularibus, vel medio majore (folium acutum) vel reliquis aequimagno (folium truncatum). *Cell.* apice 0.025 : 0.025 mm., medio 0.035 : 0.040 mm. incrassatione stellari, basi 0.025 : 0.060 mm. incrassatione maxime nodulosa.

Perianthia magna, depresso-pyriformia exalata, ore dense grosseque spinoso; *folia floralia* ovato-oblonga, margine ventrali apiceque remote dentato-spinosa.

Androecia terminalia, linearia, bracteis sexjugis, e basi julaceo-imbricata recurvis apice truncato-paucispinosis.

Bourbon. leg. Rodriguez.

23. **Schistocheila borbonica** St. *n. sp.*

Dioica, robusta, olivacea, dense depresso-caespitosa. Caulis parum ramosus, duriusculus, radicellis atro-purpureis arcte repens. *Folia* contigua, oblique a caule patentia, ligulata, decurvula, apice paucidentata vel medio dente longiore-apiculata, ceterum integerrima, margine ventrali recurvo; *lobuli dorsales* dense imbricati, obovati, insertione vel basi sua margini postico folii approximati, apice oblique truncati, angulo spina singula armato. *Amph.* caulina nulla. *Perianthia* 3 mm. longa, cylindrica, pariete crassa (8 cell. in

medio infero) basi foliis intimis et amphigastrio breviter connata, apice multilaciniata, laciniis grosse dentatis ciliatisque, convexo-conniventibus; *folia floralia* trijuga caulinis similia, margine tamen ut etiam lobulus foliigenus argute spinoso-dentata; *amphigastria floralia* quinque, infimum squamaeforme, reliqua sensim majora magisque laciniata, superum usque ad basin fere quadrilaciniatum, laciniis linearibus apiceque bifidulis vel dentatis.

Bourbon. leg. Rodriguez.

Schistocheila Neesii, cui simillima, differt foliis multo longioribus angustioribusque, involucro valde diverso.

Sine dubio *Schistocheilis* perianthium verum (ut in omnibus hepaticis ubi adest ex foliis et amphigastrio conflatum), adjudicandum est; calyptra cum perianthio alte concreta (et apice pistillis sterilibus coronata); *perianthii basis* ergo valde carnosa est; haec est "fundus" caulis autorum in Syn. Hepat. pag. 13.

24. **Schistocheila piligera** St. *n. sp.*

Sterilis. Laete viridis, depresso caespitosa, flaccida, fragilissima. *Caulis* radiculis purpureis arctissime repens, simplex. *Folia* oblique a caule patentia, contigua, tenerrima oblonga, vel oblongo-lanceolata, margine (postico recurvato) ciliis remotiusculis setaceis ubique armato; *lobulus dorsalis* fere in axi folii accretus, folio duplo brevior, medio supero liber, semiovatus acutus margine longissime ciliatus; *cellulae* pellucidae apice 0.025 mm., medio 0.035 mm., ipsa basi parum longiores, incrassatio angulosa nodosa. *Amph.* caule angustiora valde irregularia—vel ligulata pauciciliata, vel minora plus minus profunde bifida laciniis in spinas longas attenuatis.

Quoad cilias cum *Sch. ciliata* et *cristata* solum comparanda, ceterum toto coelo diversa.

Madagascar. leg. Camboué.

Leipzig, Germany, July, 1890.

EXPLICATIO TABULARUM XVII—XIX.

Figg. xii et xvii, a, ×10; fig. xvii, b, ×2; reliq. ×30.

Fig. I. *Chiloscyphus grandistipus* St. Pars caulis a ventre visa.

Fig. II. *Taxi-Lejeunea conformis* N. & M. a. pars caulis a ventre visa. b. perianthium.

Fig. III. *Eu-Lejeunea ecarinata* St. Pars caulis c. per. a ventre visa.

Fig. IV. *Cheilo-Lejeunea Kurzii* St. Pars caulis c. per. et androecio.

Fig. V. *Cerato-Lejeunea mascarena* St. a. pars caulis a ventre visa. b. perianthium. c. involucrum.

Fig. VI. *Cerato-Lejeunea mauritiana* St. a. pars caulis a ventre visa. b. Perianthium.

Fig. VII. *Lopho-Lejeunea multilacera* St. Pars caulis c. per a ventre visa.

Fig. VIII. *Acro-Lejeunea parviloba* St. a. pars caulis a ventre visa. b. Folia involucr. c. amph.

Fig. IX. *Cerato Lejeunea Renauldii* St. a. pars caulis a ventre visa. b. perianthium.

Fig. X. *Lophocolea borbonica* St. a. pars caulis a ventre visa. b. perianthium. c. folium invol. d. amph. invol.

Fig. XI. *Lophocolea inflata* St. Pars caulis a ventre visa.

Fig XII. *Lophocolea longifolia* St. a. pars caulis c. flore fem. b. perianthium. c. Folia invol d. Amph. invol.

Fig. XIII. *Lophocolea rubescens* St. a. pars caulis a ventre visa. b. perianthium. c. Folia et amph. invol.

Fig. XIV. *Plagiochila Cambuena* St. a. folium caulinum. b. Amphigastrium.

Fig. XV. *Plagiochila Rodriguezii* St. Pars caulis a ventre visa.

Fig. XVI. *Plagiochila tenax* St. a. pars caulis a ventre visa. b. perrianthium junius. c. folium florale.

Fig. XVII. *Schistocheila borbonica* St. a. Folium caulinum. b. apex plantae c. per.

Fig. XVIII. *Schistocheila piligera* St. Folium caulinum.

Celloidin imbedding in plant histology.

A. C. EYCLESHYMER.

Celloidin[1] imbedding is being used quite extensively in animal histology and offers many advantages over paraffine. It is with the view of introducing the methods into plant histology that I write the following, for which I claim but little originality.

Those who have imbedded delicate vegetable tissues, by methods requiring heat, are well aware of the extreme care necessary to avoid contraction. This is entirely avoided by the use of celloidin; moreover, alcoholic material may be imbedded directly.

To obtain the best results a celloidin free from all trace of foreign matter should be used. An excellent article is manufactured by the Chemische Fabrik auf Actien (E. Schering), Berlin. It may be obtained through the Ed. Supply Co., 6 Hamilton Place, Boston, or Bachrach & Brothers, Balti-

[1] Duval (Jour. de Microg., p. 226, 1888) states that celloidin has no advantages over collodion.

more. The prepared plates, or fragments, should be transparent, of a light yellow color, very tough and elastic; if brittle and possessing a milky opaqueness, it is of an inferior grade and the imbedding mass will be too brittle or soft.

The fragments are enclosed in an air tight chamber; a four oz. salt-mouth bottle answers well. Pour into this bottle just enough ether-alcohol (two parts sulphuric ether; one part absolute alcohol) to cover the fragments. I find that these proportions give better results than equal parts. The solution is easier and the hardening more rapid. The ether-alcohol should be added until, after occasional shaking and stirring, no fragments remain undissolved. This may take several days. It should finally possess the consistency of a very thick oil. The solution thus obtained may be labeled no. 4. No. 3 is obtained by taking two volumes of no. 4 and diluting with one volume of ether-alcohol. No. 2 by proceeding in a like manner with no. 3. No. 1 is a mixture of 95 % alcohol and sulphuric ether equal parts.[2]

The saturation and final imbedding is accomplished thus: The object is transferred from 95 % alcohol to solutions 1, 2, 3, 4, successively, in each of which it remains from a few hours to days, depending upon the size and permeability. For most tissues twenty-four hours in each will suffice. It often occurs that one desires merely to hold the object in situ for cutting; this is generally attained by passing the object through solutions 2 and 4.

In imbedding, the first thing necessary is to provide boxes. They may be made in the following manner:[3] The end of a pine block is trimmed to the desired size, e. g., 1 cm. long by 1.5 cm. wide. For a box of these dimensions, and 1 cm. deep, a piece of ordinary porous letter-paper may be cut in rectangular form 3 cm. wide by 6 cm. long.

Place the center of the end of the block over the center of the paper, the longer axes of the end of the block and paper parallel. The sides are now pressed against the sides of the block. Then the ends in the same way, leaving four projecting wings at the angles of the block. Fold in the wings against the narrower sides and press the ends of the paper, that now project above the level of the box, down over the

[2] Schiefferdecker (Arch. f. Anat. u. Phys., I Abth., p. 199, 1882) uses two solutions, one syrupy, the other much thinner. Objects are transferred from absolute alcohol to thinner and then to thicker. Minot (Whitman's Embryological Methods, p. 114, 1885) uses three solutions: 1. Ether and alcohol equal parts. 2. Thin solution of celloidin. 3. Thick solution of celloidin. I prefer the four solutions given by Apathy (Zeit. f. wiss. Mikr., p. 45–49, 1888.)

[3] Whitman's Embryological Methods, p. 97, 1885.

ends of the box. A thin plate of lead is placed in the bottom[4] and the imbedding solution poured in. The object is taken from the same solution and, with needles wetted in ether, placed in the desired position. Fine needles may be passed through the box to support the object. There are many other methods of imbedding.[5] I believe the method given, however, to be the best suited for general purposes.

Hardening is accomplished by various methods[5]. I prefer that given by Viallam,[6] of immersing in chloroform since the operations may be carried on with much greater rapidity. An air tight chamber should be filled with chloroform; a very wide-mouth bottle will answer. After it is thoroughly hardened, which requires about twenty-four hours, the mass is removed and the paper cut from the sides.

It is now ready to fix for sectioning. Basswood blocks are trimmed to fit the clamp of the microtome. Solution no. 3 is poured over the block and allowed to partially harden; pour on a little more of the same solution and press down the celloidin block, after dipping the under surface in ether, into it. Place in chloroform until hardened.

The sections are now cut. Care should be taken that the knife is placed as obliquely as possible and constantly wetted with 70 % alcohol. An ordinary wash-bottle may be used for this purpose, or one can easily arrange a dripping apparatus.[7] The sections may be removed, with a camel's hair brush, to a watch crystal containing an alcoholic stain. If an aqueous stain, they are passed through the lower grades of alcohol, 50 %, 30 %, to water, stained, run back through the

[4] Suggested by Prof. J. E. Reighard.

F. Blochmann ("Ueber Einbettungsmethoden," Zeit. f. wiss. Mikr., I, p. 218, 1884) prefers imbedding on cork. One end of a cork is surrounded by a strip of paper, which is fastened by a pin. In the cup thus formed the object is imbedded. A pin is passed through a piece of lead and stuck into the bottom of the cork. The mass is now placed in the hardening fluid. This method offers advantages, since hardening and fixing are obtained at the same time. Instead of cork, which gets soft and spoils the alcohol, because of the tannic acid, I use basswood cylinders, which are preferable to anything I have tried. Apathy (Zeit. f. wiss. Mikr., VI., pp. 164-70, 1889) uses glass boxes. Into these is poured the imbedding solution. The box is filled to the brim and covered with a glass plate. This prevents the surface from hardening and allows the air bubbles to escape. The plate is replaced in a few hours by a belljar, and when a film has formed, in six to eight hours, 75 % alcohol is poured on. In twenty-four hours the mass is ready for cutting. Flormann (Jour. Roy. Microscopical Soc., Feb., 1890) imbeds in a glass capsule in a thin solution, and solidifies by allowing the slow evaporation of the solvent. Thoma (Jour. Roy. Microscopical Soc., p. 305, 1883) covers a cork with a thick solution of celloidin. Upon this is placed the object which is covered, layer after layer, with celloidin, allowing each to partially dry. When the object is covered it is immersed in alcohol until dry.

[6] "Recherches sur l'Hist. des Insectes," Paris, 1883, quoted in Lee's Vade Mecum.

[7] See Whitman's Embryological Methods, p. 115.

grades: 30 %, 50 %, 70 %, 82 %, 95 %. If balsam mounts are desired they are transferred to absolute alcohol, cleared and mounted.

I can highly recommend the use of phenol as a clearing medium, since it clears after low grades of alcohol. Dr. Bergonzini[9] transfers sections from aqueous stains directly to phenol which is followed by balsam. I have used a mixture of bergamot oil and phenol equal parts with excellent results. Creosote and oil of cloves dissolve celloidin but clear well. The sections may be transferred to a watch crystal filled with the clearing medium. After clearing they are arranged on the slide and the balsam applied.

If the object can be stained *in toto*, which is often the case, much time may be saved by the following method: The stained object is imbedded in the usual manner, but after hardening in chloroform, and removing the paper, the celloidin block is transferred to 95 % alcohol for twenty-four hours then to carbolic acid, bergamot oil or glycerine in which it becomes as transparent as glass.[10] The block is fixed in the usual manner.

Orienting is now accomplished with the greatest ease. In cutting, the knife is wet with the clearing medium. The sections may be arranged in serial order on the knife blade until a slide full is obtained, when they are transferred, balsam applied, and mounted. By this method long series[11] are handled with ease. Glycerine is used only when the mounting medium is glycerine or glycerine-jelly. Since these are used quite extensively the method may prove to be of value.

The blocks may be preserved for an indefinite time in alcohol, bergamot oil, carbolic acid, glycerine, etc. It is often desirable to mark the blocks for future reference. The

[8] Weigert (Zeit. f. wiss. Mikr., p. 480, 1886) uses a mixture of three parts xylol and one part phenol for clearing sections stained with haematoxylin or carmine. Aniline stains are decolorized by its use. Unna (Jour. Roy. Microscopical Soc., p. 518, 1887,) states that glycerine and carbolic acid quickly and permanently extract all basic aniline dyes. Martinotti (Zeit. f. wiss. Mikr., p. 153, 1887) cautions against the use of xylol since it destroys delicate structures, such as karyokinetic figures. J. Van Gieson (Am Month. Micro. Jour., p. 49-51, 1887) claims that the only satisfactory clarifier is oil of Origanum.

[9] Lo Spallanzoni, p. 196, 1883.

[10] The method of clearing in mass is advised by Selenka (Zool. Anz., p. 130, 1878) for albumen.

[11] H. E. Simmons (Microscope, p. 73, 1887) gives a method of fixing sections in serial order. They are cut and arranged on the slide in the desired position. 95 % alcohol is applied for a few minutes then drawn off. Sulphuric ether vapor is poured over the sections in which they immediately soften. They are now transferred to 80 % alcohol which hardens the celloidin, retaining them in position, when they are run through the grades of alcohol, stained, dehydrated, cleared and mounted.

end of the block is wet in solution no. 1, a piece of paper with the desired data is stuck on and washed over with solution no. 3.

In conclusion I may say that I have tried nearly all the methods employed in celloidin manipulation and have succeeded best with the above, which is largely a combination or modification of methods already known.

Botanical Laboratory, University of Michigan.

The Collodion method in botany.

M. B. THOMAS.

In any original investigation in the field of histological botany the worker is at the outset confronted with the all important question of how to prepare the material so that it may be available in the best possible condition for thorough systematic observation and study. The old method of making freehand sections in careful investigations is now gone by and the best histologists look for some substance with which to infiltrate the tissue and bring it into a condition where uniform serial sections can be made. Many substances have from time to time been offered and met with varying success. Some of the more important ones that have been tried are gelatin, gelatin soap, gum, paper, shellac, wax, gum arabic, soap, paraffine and collodion. The last two substances have seemingly supplanted the others and indeed they seem to offer all the advantages that can be secured by any of the others.

The paraffine method as applied to plant tissue was published by Dr. Moll in the BOTANICAL GAZETTE of January, 1888, and later many modifications of it have been given and the method much improved. The method has been quite extensively used, but is very long and quite disagreeable to manipulate, often requiring 10 or 12 days to bring the tissue into proper condition for sectioning. For proper infiltrating with paraffine a temperature of from 45° to 50° C. is required, and for some of the more delicate tissues this in my hands has proved fatal. The method is admirably adapted, however, for many tissues that can be held in position for sectioning in no other way, as is the case with mature seeds or woody stems. The collodion method is now coming into general use for nearly all kinds of plant tissue. For the use

of collodion for infiltrating we are indebted to Duval who first published his results in the *Jour. de l' Anat.*, 1879, p. 185. A little later Merkel and Schiefferdecker suggested the use of celloidin which is merely a patent collodion. This appeared in the *Archiv. f. Anat. u. Phys.*, 1882, p. 200. Some discussion then arose regarding the relative merits of each, but it is generally agreed that one has little or no advantage over the other. The method as applied to plant tissue is a comparatively new one. In 1884 we find a short description of it in Strasburger's Botany and some few modifications of it have since been offered.

In the histological laboratories at Cornell University, under the direction of Professors S. H. Gage and W. R. Dudley, I have tried the method with its various modifications on many different kinds of plant tissue, and find the following operations to be in every particular the best to obtain uniformly good results:

The tissue to be treated is first dehydrated and hardened in alcohol. For this purpose a Schultze's apparatus is of the first importance; in fact I have found some tissues that could be hardened in no other way without shrinking. The results fully warrant the statement that no one engaged in histological botany can afford to be without such an apparatus. Many forms of it have been suggested, but for most plant tissues one which will be found very convenient can be made by fitting into a Whitall-Tatum museum jar a rack in which several dehydrating tubes can be supported at any desired level in the alcohol contained in the jar. In place of the parchment diaphragm usually used I recommend the use of chamois skin. With such an apparatus, from 12 to 25 hours is sufficient for hardening and dehydrating any plant tissue. In using the apparatus the tissue should be packed closely in the dehydrating tube, and enough 50 % alcohol added to just cover it. The tube is then sunk in the 95 % alcohol in the jar until the two liquids are at a level. The strength of the 95 % alcohol can be kept up by adding to it, from time to time, some calcium chloride. This will not in any way injure the alcohol. The tissue is taken from the 95 % alcohol and placed in a 2 % solution of collodion, made by dissolving 2 grams of gun cotton in 100 cc. of equal parts of ether and alcohol. In this it is allowed to remain from 12 to 24 hours, depending on the nature of the tissue, 24 hours being enough for the very firmest. It is then transferred to a 5 % solution, or the 2 % solution is allowed to evaporate until it is of the consistency of the 5 % solution. The former method

is more uniformly satisfactory. The tissue is allowed to remain in this solution about 12 hours. It is then taken out and arranged in position on a cork or block of wood of convenient size to fit in the jaws of the microtome. It is not necessary that the corks be previously soaked in collodion. By means of a camel's hair brush the material on the cork is covered with successive layers of thick collodion until it is quite enclosed in the mass, allowing each coat to dry slightly before applying the next. After the tissue is covered it is allowed to harden in the air a few minutes and then placed in about 80 % alcohol to harden. Much difference of opinion exists regarding the proper strength of alcohol to use for hardening the collodion, but 80 % answers very well, and the tissue can be kept in it a long time without deteriorating. After a few hours the collodion will be hard enough to section. For sectioning any sliding microtome will answer the purpose, but one especially adapted for this work will enable one to incline the object (which can be clearly seen through the collodion) in any desired position and to take sections in any desired plane. It is also necessary that the sections be removed with long sweeping cuts, since direct cross cutting would tear them. The sections should be kept covered with alcohol while being removed, and then floated from the knife to the slide. The slower the section is cut the better it will usually be. Serial sections can be arranged in their proper place on the slide. For fixing the sections some dry ether ether vapor is blown upon them. A very convenient form of apparatus for the purpose can be made by fitting two tubes into a wide-mouthed bottle as in making a wash-bottle, except that the entrance-tube dips below the surface of the ether and the exit-tube is above the ether. The inner end of the exit-tube should be expanded into a bulb, in which calcium chloride is placed to dry the vapor as it passes out. The ether vapor dissolves the collodion and fastens the sections to the slide. The sections are then washed with water, stained, the surplus stain washed off with water, the sections dehydrated with alcohol, cleared and mounted in balsam. For clearing, a mixture used by Prof. Gage for animal histology will be found to work admirably It consists of 3 parts of turpentine and 2 of carbolic acid. It clears quickly and will not injure the most delicate tissue. For staining, one must use that which seems best adapted for his purpose, but for general study hæmatoxylin seems especially adapted to collodion sections.

Some difficulty may arise in cutting sections which have

in them free parts. It sometimes happens that they become detached from the collodion and float away. In this case the section can be collodionized as was first suggested by Dr. Marks. This is done by coating the tissue before each section is cut with a thin coat of 1 % collodion, using a camel's hair brush for the purpose. Then draw the knife across the tissue very slowly, keeping alcohol dripping on it while the section is being cut. In this way beautiful longisections of large compound pistils can be obtained in which the sections of ovules, though not held in place by the placenta, will, nevertheless, remain in their proper position and perfect serial sections of each ovule obtained.

Care should be taken that none of the sections be cut before collodionization, for although it may not always be necessary to keep the parts in place, yet it is always a safeguard against their displacement. The method as given is found to work admirably on very delicate meristematic tissue. No heat being required the most delicate of tissue will not shrink. Then, too, the shortness of the method commends it to general use. I find that 2 days or even 36 hours is sufficient and is even better than a longer time to go through the whole operation of hardening, infiltrating and sectioning nearly all kinds of plant tissue. The material may apparently be left in the thick collodion indefinitely without deteriorating. The sections after being cut can be handled with a camel's hair brush without danger of breaking. By a little experience one will find that the method as given will enable him to bring to his hand material with which to pursue with certainty any investigation in histological botany.

Cornell University.

A biographical sketch of J. B. Ellis.

F. W. ANDERSON.

(WITH PORTRAIT.[1])

The subject of the present sketch was born at Potsdam, N. Y., January 21, 1829. He evinced a remarkable fondness for study at an early age, and the time not spent at school or at work on his father's farm was devoted to reading. At the age of sixteen he taught the winter school at Stockholm, St. Lawrence county. Here the lad received for his services ten dollars a month and "boarded around." Five of the ten dollars was paid in cash, the other five was

[1] By mistake of binder the portrait of Mr. Ellis was bound with the October GAZETTE.

to be paid in grain. It was just twenty years afterward when the last of the grain was turned over to him. Having completed his academical course he entered Union College at Schenectady, N. Y., in the fall of 1849. By the end of the fall term his funds were exhausted and he had to seek employment for the winter. So, in company with A. B. Smith, now a successful lawyer of Poughkeepsie, N. Y., he started afoot into Saratoga county to find a school to teach. After walking for some miles they came to where the road forked in the midst of a dense pine wood. Not knowing which fork to take a stick was set up on end and allowed to fall. It fell towards the right-hand fork, which the young men followed and soon came to the village of Charlton. Here Mr. Ellis got a school while Smith went on to Galway, the next village, and fortunately got the school there. In June, 1851, Mr. Ellis graduated from Union College with the degree of A. B. (since advanced to A. M.), and went to Germantown, Pennsylvania, into a select school with the Rev. D. Washburne. He had studied botany a little at college but it was here that he commenced to take an active interest in phanerogamic botany, little dreaming what the outcome would be. The earliest plants he remembers collecting were Liparis liliifolia and Lygodium palmatum. In November, 1851, he severed his connection with the school and entered the Albany Academy as classical tutor, remaining one year. This position was better suited to his taste for he had decided to become a professional teacher of classics. George H. Cook, recently deceased, state geologist of New Jersey, was principal of the academy. The evenings were spent making blow-pipe analyses of minerals with G. W. Taylor, a fellow tutor. The following year he and Taylor went into a select school together for three months, but as it did not pay the school was broken up and Mr. Ellis returned to Potsdam. While with Taylor he saw by chance a notice of Ravenel's Fungi Caroliniani exsiccati, the first thing of the kind ever issued in America. While at college he had frequently noticed the agarics, but not knowing where to get books or information concerning fungi let them alone. But upon seeing the notice of Ravenel's collection he wrote to him and then commenced a correspondence (in 1857), interrupted only by the war, which lasted till Ravenel's death. He continued collecting phanerogams until 1870, at the same time giving gradually more and more attention to fungi. In 1870 he sold his phanerogamic collection, containing about 1,000 species, to St. Lawrence University, Canton, N. Y.

In May, 1853, he moved to Poughkeepsie, entering a Mr. Bartlett's boarding school as classical teacher, and stayed two years. While there he and Prof. Buckhout, now of State College, Centre county, Penn., collected plants on Saturdays, and, said he, "on Sundays, too, if we could steal away, for Mr. Bartlett was very pious." In February, 1855, in company with his sister, Mrs. L. B. Doud, late of Plattsmouth, Neb., he left Poughkeepsie for Charleston, S. C., with the intention of teaching school there. He called on one of the professors in the South Carolina College to seek information on the subject. Said he: "I told him that I had come South to teach and make a home there. He at once asked me whence I came, and when I answered from New York, he replied, while slowly swinging in his revolving office chair: 'Well, the state of feeling between the North and South is such that I doubt very much whether you will succeed.'" And he didn't. From Charleston he and his sister went to Alexander, near Augusta, Ga. Here he succeeded in obtaining a position in an academy and taught one term. One morning he went to the class-room and found a huge living snake writhing about in the big open fire-place suspended by a stout string tied tightly about its middle and hanging from a hook in the chimney, where the boys had placed it for fun. Upon my once inquiring whether any incident of special interest had occured while he was there, he replied: "No; the most interesting incident was to get away, that is very distinct, even now." He returned to Potsdam, and on the 19th of April, 1856, an event took place which made it possible for him to do the enormous and valuable work he has since done for American mycology. This was his marriage to Miss Arvilla J. Bacon, who has been a faithful partner in all the vicissitudes of life, and a constant and painstaking assistant in his mycological work for the past thirty-four years. They have one daughter, who is one of New York's most popular professional musicians.

In the fall of 1856 he became principal of Canton Academy. In 1863, he, with Mrs. Ellis, went into one of the public schools in Potsdam village. He was engaged there until September, 1864, when he entered the United States Navy at Brooklyn, N. Y., and spent the winter of 1864–5 on the United States steam frigate Susquehannah of the North Atlantic Blockading Squadron. He was present at the bombardment of Fort Fisher three days in December, 1864, and three days in January, 1865, when the fort was taken. While on the war ship he became acquainted with a man

named Hale from New Jersey, who told him of the good climate in the vicinity of Newfield. At the close of the war, in the spring of 1865, Mr. Ellis once more returned to his native town (which he has but once visited since) and removed his worldly possessions to Newfield, N. J., where he has continuously lived, twenty-five years having been spent under his present roof. Since living here he has been engaged in a variety of pursuits.

At last, in 1878, he dropped every thing else and commenced to devote his whole time to fungi, desiring to disseminate more widely a knowledge of North American fungi and to arouse home botanists if possible from their apathetic indifference towards these plants. He decided to begin in a modest way by issuing ten sets of New Jersey fungi under the title of "Fungi Nova-Cæsarienses." He put up ten centuries on sheets of paper in boxes. Of the two sets sold one went to Dr. Farlow the other to Mr. Isaac C. Martindale. About this time Mr. Ellis went to see the latter gentleman, who asked, "Why not call it N. A. F."? Mr. Ellis seeing the greater appropriateness and scope of such a title recalled the two sets and concluded to get out a series of centuries in bound volumes, entitled North American Fungi. At that time he was so pressed for means that he had not money enough to get the books made for the first two centuries. Thereupon, Prof. Farlow, who favored the scheme, had the books made in Boston and advanced them to Mr. Ellis, who paid for them as soon as he was able. The centuries took well from the start, and from thirty-five sets to begin with the demand rapidly increased up to fifty-three sets, which number of copies has been issued regularly for the past five or six years. Altogether twenty-five centuries have been issued, or, about 1,200 separate volumes have been made, filled with specimens and sold. Truly "N. A. F." has become, I might say, a household phrase with the cryptogamic botanists of this country and Europe. In all this great undertaking, as well as in others to be mentioned in an article on Mr. Ellis' great herbarium, the cheerful interest and practical helpfulness of Mrs. Ellis has been constantly apparent. She has made and bound all the books except the first sixty which Dr. Farlow kindly advanced for his friend at the beginning. Nearly all of the specimens have been cleaned, sorted, put into neat pockets, labeled and fastened into the books by her own hands. Mr. Ellis himself says, that owing to his great correspondence and the enormously burdensome quantity of material constantly being sent to him for deter-

mination and comparison, he would not have been able to get out the N. A. F. without her valuable aid.

From 1876 to 1879, not having at that time the books and exsiccati collections necessary for independent work, many specimens were sent to Dr. M. C. Cooke who determined and published them in *Grevillea* Under the circumstances then existing this course seemed necessary though it called out some adverse criticism at the time.

Since 1880 Mr. Ellis has been associated with Mr. Benjamin M. Everhart, who has freely placed at his friend's disposal his splendid botanical library and extensive mycological collections, and to whose aid and counsel Mr. Ellis feels greatly indebted.

In July, 1878, Mr. Ellis was elected a corresponding member of the Academy of Natural Sciences of Philadelphia. In August, 1882, he was elected a corresponding member of the Cryptogamic Society of Scotland, and in December of the same year was elected corresponding member of Die Kaiserlich-Königliche Zoologisch-Botanische Gesellschaft in Wien.

Mr. Ellis leads a quiet and retired life well suited to his studious, sensitive nature. Although he moved about considerably in his younger days he was always fond of home, as can be plainly seen from his invariable return to Potsdam, his native town, after every venture into the outer world. Too much excitement of any kind affects him painfully even now. With considerable quiet humor he tells how that when he was teaching in Mr. Bartlett's school he determined on three different occasions to go down on the boat to New York and stay there several days to "do the city," and each time returned home on the first train he could get, suffering with a violent headache caused by the excitement of the trip and the noisy bustle of the city. His fellow-botanists feel his influence and recognize the value of his work, but wonder why they never see his kindly face at any of the botanical meetings of the country. It is simply because his health at all times precarious, demands constant quietude coupled with strict simplicity and regularity in his daily life. A thorough scholar and quite a linguist, he is perfectly familiar with Latin, Greek, German and French and has also a good practical knowledge of Polish, Swedish, Italian and Spanish.

What Asa Gray was to American phanerogamic botany, Job B. Ellis is to American mycology. He is now looking forward with pleasant anticipation to the publication of a

manual of North American Pyrenomycetes which, when it appears, will undoubtedly give a great impetus to the study of fungi in this country. Long may he remain in our midst working with and for us! Despite a checkered and toilsome life in past years, often in financial straits, and always burdened with delicate health, he has probably done more than any other man in America to advance the knowledge of our native fungi and to stimulate the ardor of every student of mycology.

New York City.

Notes on the flora of the Lake Superior Region. III.

II. Vermilion Lake, Minnesota.

E. J. HILL.

From the copper region of Keweenaw Peninsula I went to Vermilion Lake, the center of the iron mining of Minnesota. The passage by boat from Houghton to Duluth affords some fine views of scenery along the south shore of Lake Superior, since, for one day at least, daylight will be had. Of these, the most noteworthy are Porcupine Mountain, near Ontonagon, and Ashland and Bayfield with their beautiful bay and the outlying Apostle Islands, and the traveler will not soon forget his first sight of Duluth from the water below, or the climb to the hills above to see the city from another outlook, a terraced city with streets rising one above the other on the rocky slope, making it possible to get a birdseye view of the place from a single spot, as it spreads like a map before you. From here one goes by the Duluth and Iron Range Railroad, a ride of a hundred miles, to Tower, on Vermilion Lake. For a third of the way the road runs along the shore of Lake Superior, though the sight of the lake is cut off a good part of the time by intervening woods, as the road keeps near the foot of the hills which come down rather steeply, leaving a strip of more level land between them and the beach. The trees are mostly of the hardwood kinds, interspersed with conifers. On reaching Two Harbors, the shipping point of the iron of the adjoining region, the road turns abruptly away from the lake, and for the rest of the way is little more than a lane cut through the woods. Scarcely a settlement is seen till within a few miles of Tower, the house or two, when a station occurs, being for the employees of the road.

As the railroad winds about among the low drift hills or cuts through the ledges of rock or drift, crossing a small river now and then, the passenger finds little to do outside but study the trees and boulders along the way. It soon becomes monotonous, the nearer view being too often the inevitable burnt district of bare and blackened trunks skirting the road on either side, with a rank growth of weeds and brambles, or seedlings of maple and oak, along with the elm and maple, and the ever present paper birch, its white trunk sharply limned on the surrounding green or gray. One sees many tracts of pine, the red, the white, and occasionally the gray. The trees of the economic kinds are generally small, and few of the logs seen at the mills in Tower were more than fifteen inches in diameter, the average being even less. This would not appear to be because the largest have been culled, though this may be true to some extent, but because the trees are naturally of smaller size. I noticed the same, the year before, at the entensive mills at Chicoutimi on the Saguenay. It is true the yellow pine is always somewhat small and slender, but though some larger boles of white pine were occasionally seen, they nowhere showed the vigorous habit of those found in Michigan and Wisconsin, if haply a wood untouched by fire at all were met with. There is much swampy land, not generally in large areas, but frequent patches of low ground left by the retreating ice-sheet of the great glacier, whose evidence is seen on every exposed outcrop of scored and planed rocks, hollows strewn with boulders, over which is spread a covering of peat, a congenial soil for tamarack, spruce and cedar. These hidden boulders become visible when a fire has perchance attacked the drier parts in a time of drought, and they lie so close as to almost touch each other. The soil is unusually thin, of a clayey or sandy loam, reddish with iron-oxide in the vicinity of the iron ranges. As usual, the pines predominate on the sandy soils and rocky hills. With boulders so thickly spread in many places that they may serve as stepping-stones, and ledges of rock outcropping on every hand, it will pass for a rugged country, much of it of slight use to agriculture, and of little attraction to the eye after the covering of timber is removed. There are spots by the lakes and streams fit for the plow, and the "homesteader" is already there, finding a fair requital for his labors in a quick-growing crop. Some of the water courses between the hills are marvels of stoniness, a lengthened pile of boulders of all shapes and sizes, as if washed out

of the contiguous slopes and rolled into the valley, or left to accumulate one above the other as the softer earth has been carried to a lower level. Walking over these one hears the water making its way among them beneath his feet, out of sight and often out of reach should he seek a cooling draught. Here, as in northern Michigan, when the timber is removed, if the soil is not too sandy, a growth of maples soon springs up, and on the sandy and rocky soils one of oaks, the damp lands of either kind yielding one of poplar.

Vermilion Lake is a stretch of water about as irregular in outline as can well be imagined. As depicted on a map it may be described as amoebiform. Abounding in islands and rocks, most of them covered with trees, and with long tongues of land jutting into it, not much of it is visible at once from any part of its shores or surface. Yet it furnishes many delightful views from its waters or the surrounding shores and heights. Passing over it by boat these views are continually changing. With a length of thirty miles, it is said to have, including its island shores, a coast line of more than two hundred miles. Two streams enter it at Tower, East Two Rivers and West Two Rivers. These offer reaches of marshy and overflowed land, as they bring down the sediment and gradually fill the lake at this point, the mouths of the two streams being near each other. Through these low flats of aquatic plants the streams wind with a sluggish current, in marked contrast to the rate of flow when the rocks of the surrounding woods are reached. Rowing up the larger stream to examine and collect the plants, the ride came to a sudden end when this boundary was attained.

Such, in brief, is the nature of the country at Vermilion Lake, in which twelve days in the latter half of August were spent in studying its flora. It did not materially differ in its general features from that just left in northern Michigan, the later season of collecting offering the main distinction. The Compositæ were out in greater numbers, but there were none of special interest that need be recorded here. It was in other groups of plants that I found most of profit.

Ranunculus multifidus Pursh., var. *terrestris* Gray, was detected in one locality near Tower, along the bank of East Two Rivers, near the railroad crossing. It does not look much like the floating plant, and at sight would hardly be thought to have any specific relation to it, being in habit and appearance much more like R. Cymbalaria and R. Flammula, var. reptans. Its mode of growth is almost identical

with the latter, and it affects about the same conditions of soil and dampness, or perhaps where it is a little more muddy, or with less of sand and gravel. The stems are small, creeping about and rooting at the joints. None of the leaves are dissected, but are reniform, and usually three to five-cleft. The flowers are small, from a fourth to a half inch in diameter, bright yellow, and of eight to ten parts. In the bud three of these enclose the rest, making an outer whorl of three which I take to be the sepals, two of the edges imbricate and one valvate or a little spaced, as figured by Eichler[1] for R. Ficaria and the involucre of Anemone Hepatica, though not as in La Maout et Decaisne,[2] where the three are figured as imbricating. The next whorl is of three, alternating with the sepals. The succeeding parts did not seem exactly as in the Ficaria group, being more developed on one side than on the other, so that the deviation may have been due to the immaturity of the material, the buds being studied after my return and not from fresh material in the field, as this feature of the plant did not at first attract attention, though several of the dried buds were analyzed. This should be looked into by those who can have access to abundance of material. The fruit also does not agree very well with that of R. multifidus. Aside from its much smaller size, it has a recurved or uncinate beak. I looked for R. multifidus in the adjoining stream, thinking this might be a variety of that plant, but did not find any, nor did I meet with it in any place about town. The question whether the two are of the same species will bear further investigation. The description in the last edition of the Manual varies somewhat from that given in the preceding, where it is said the upper leaves are reduced to oblong or linear bracts. The terminal division of the leaves is three-lobed, the latter generally two-lobed or cleft, and the upper leaves are mostly of the form of the terminal division, which rarely is reduced to the middle lobe, like an oblong bract. The mass of the leaves is quite uniform in shape and lobation, the tendency being to a ternate division both of main and secondary parts.

Another of the *Ranunculaceæ* of more than common interest was *Caltha natans* Pallas, new to the United States. It has hitherto been known in North America as belonging to British America, and is described by Hooker and Richardson as creeping on the surface of deep sphagnous bogs.

[1] Blüthendiagramme, II Theil, fig. 60, 63.

[2] Traité de Botanique, p. 391.

Those found in Minnesota were in pools and ditches along the railroad, first seen about ten miles east of Tower, and then in running water nearer the town. Once it was found in a streamlet by a wood's path between the village and the iron mines, where the water had quite a current. Macoun also mentions its growth in flowing water. It has but little resemblance to the common marsh marigold, except in the shape of the leaves. These are much smaller and rest upon the water, borne on petioles of varying length. The stem creeps in the ooze of the bottom, sending out roots from the nodes, the upper part floating. It has inconspicuous flowers, a third of an inch across, commonly two on a forked peduncle. Their color is pale pink. None were seen purely white. The anthers were also tinged with pink. Pursh (Flora, 390, under C. flabellifolia) says that the flowers of the specimens collected by Pallas in eastern Siberia, which he saw in Herb. Lambert, were "white with a tinge of red." The head of fruit is roundish, half an inch in diameter, composed of 20–30 pitted follicles. The stations for this plant mentioned in Macoun's catalogue are several hundred miles to the northwest, at the headwaters of the Saskatchewan and Athabasca rivers, Peace river tributaries and Methy river, near Methy Portage. The latter is in latitude 57°, or about 900 miles from Tower. On the authority of Hooker he gives it as occurring in the central districts from the eastern provinces to latitude 60°, but with the question mark after the eastern provinces. Tower is in latitude 48°.

The only Lechea seen was one called by Mr. W. H. Leggett, who had given special attention to these plants, *L. minor* Lam., var. *stricta*. It grows on sandy hills, especially those thinly covered with Pinus Banksiana and P. resinosa, where the ground is not too much shaded and on rocky hills and ledges with a thin covering of soil, on the top of one of which, Jasper Peak, the highest point in the vicinity of Tower, I found it common. It is the same form as was found in 1882 in the Northern Peninsula of Michigan in the Menominee iron region, growing in light, sandy soil. It is also the most abundant Lechea around Chicago, unless we except *L. major* Mich., and is found elsewhere in northern Illinois. It is not granted varietal distinction in the revised Manual, though well marked and easily recognized by several characters, as its strict mode of growth, numerous appressed branches thickly covered with fruit, its common habit of sending up several stems from the same root, its

copious supply of radical shoots late in the season, usually making a somewhat dense, cushiony tuft spreading nearly flat on the ground. Having sent Mr. Leggett some forms of L. minor quite different in mode of branching and growth, more bushy and with a distinct habitat, readily detected by its appearance, he concluded that L. minor, var. stricta, was specifically distinct, but I do not think a characterization was ever published, or perhaps made out, as it was not long before his death. I find no tendency in the forms growing here to grade into one another, and they are distinguished without difficulty. What appears to be the same has been sent me from New England, and I think it likely that the one Mr. Leggett distributed as L. minor, var. intermedia, should go with it, though somewhat coarser and with larger fruit. Having gathered from different sections considerable material which goes by the name of *L. minor* Lam., much of it proves unsatisfactory in classification, and the last word has hardly been said about this difficult genus. Of the two plants found at the West and North, it may be added that one, having the strict habit of growth, is met with in open places of dry woods, or along their borders, or in fields, such places as are frequented by L. major, while I have always found the others among the low bushes, between the dry sands and the wet margins of sloughs, conditions of soil which in open places furnish a congenial home for L. thymifolia Michx. A little experience soon shows where to look for either, and the other need not be sought under the same conditions, though it may occur in the immediate vicinity. These habitats are so characteristic and constant that I have sometimes tested the matter by selecting beforehand from some more elevated place spots where each might be looked for, and then verified the fact by finding the respective kinds, if either was present.

An interesting form of Impatiens fulva was found in the woods, growing with the typical plant. The flowers were whitish mottled with red spots, the general effect by blending of colors being pink. It was plentiful in the single locality where it occured.

Fine specimens of three closely-related species of Papilionaceæ grew in company on the hills from which the timber had been burned, and where bushes and brakes had sprung up thickly. These were Vicia Americana, Lathyrus venosus and L. ochroleucus. All were very vigorous plants. The Vicia was high-climbing and slightly pubescent. The upper part of the stem of L. venosus and the lower surface of

its leaves were downy. The flowers of L. ochroleucus were very pale, barely tinged with yellow.

Rosa Engelmanni Watson was the most common species of rose seen in the region, exceeding in abundance R. Carolina, the only other kind noticed. Along the shore of Vermilion Lake the bushes sometimes reached a height of six or seven feet, and almost everywhere had a remarkably thrifty look. There is an appearance about the plant not altogether easy to describe, since it appeals to the eye and needs to be seen for adequate appreciation, though it may in general be designated by thriftiness. This makes it look quite different from R. blanda, with which it is apt to be confounded. It is very leafy and has large, well pronounced leaflets, broad in proportion to their length as compared with R. blanda, though not always so, usually softly pubescent as well as the upper part of the stem. The time of flowering had passed, but as the fruit is one of the main distinctions, it was easy to identify. It is a handsome shrub, with its large prominently-veined leaflets, palish and finely set off by an abundance of red or reddish-yellow fruit. The younger shoots are sometimes glaucous as well as the leaves beneath. The hips were mainly obovate-oblong, rather more than half an inch in length. The size of the bushes varied with the soil; in lower and fertile ground they were tall and branching more freely, in poor soil, such as supported Pinus Banksiana, low and more slender.

These specimens from Minnesota in connection with the description and figure of the plant in *Garden and Forest* for August 7, 1889, enabled me to determine the presence of R. Engelmanni in our pine barren region on returning home in September. Several specimens of the genus Rosa, whose study had not been satisfactory before, were collected in June and July while in flower, and the localities and bushes marked so as to obtain the fruit when mature. There was one form assigned with some misgivings to R. blanda since it did not very well agree with it. They were usually plants of a strong habit of growth, with large and abundant blossoms, remarkably striking when racemosely arranged on short side branches along the more simple stemmed forms, sometimes for a space of two feet, all in flower at once, and quite wand-like in look. On going to these spots in the fall I found the bushes covered with oblong fruit and presenting the same general appearance as those about Tower. The fruit in the Lake Michigan specimens is oblong, so far as observed,

tapering about equally above and below from the middle; subsequently I observed it in several places in Lake county, Indiana. It is taller and more robust in peaty or wettish ground, reaching in one case a height of six feet, and lower in the sands where it grows with P. Banksiana. The present season (1890) I have seen it in Cook county, Illinois, within the limits of Chicago, and confidently expect to see it covered with the oblong fruit later in the year. This experience in field study shows that there is more than the fruit to distinguish R. Engelmanni from R. blanda. I was not aware of the existence of the former species till the copy of *Garden and Forest* reached me at Tower about the 20th of August. This was more than two months after the specimens had been gathered and selected out for comparison when the fruit should mature, the time of collecting in flower being June 14th. Practically, then, the species can be separated from allied forms at the time of anthesis, and to me it was independent of other help. It is probable that the species will will be found in other localities along Lake Michigan, having evidently been overlooked or confounded with R. blanda. I may add that the work of the season, together with that of 1890, gives five species of Rosa for the vicinity of Chicago, the lake flora taking four, R. Engelmanni, R. blanda, R. Carolina and R. humilis, and the Des Plaines river one, R. setigera. And it should also be added that there are forms of these lake roses which are still troublesome to assign, as there seem to be gradations, perhaps intercrossing, since they often grow freely in close proximity, especially the first three. The first two are commonly two or more weeks earlier in time of flowering, being quite well out of bloom when R. humilis is at its best, and R. Carolina just beginning to open.

Englewood P. O., Chicago, Ill.

BRIEFER ARTICLES.

Simple device for illustrating hydrotropism.—Take an ordinary nickel plated clock, remove the thumb-piece at the back which is used to turn the hands, and solder it to the bottom of a cylindrical tin box about two inches in diameter and three or four deep, in which the seeds are to be planted. Now when the thumb piece is slipped back in place on the square shoulder of the shaft which turns the hour hand, the tin box will,

when the clock is running, revolve once an hour on a horizontal axis this will do away with the effect of gravity in determining the direction of growth in the germinating seeds. Now fill the box half full of moist sawdust, place on this a number of easily germinating seeds and fill the remainder of the box with dry sawdust, held in place by tying mosquito netting over the mouth of the box. Set the clock going and let it stand in a warm place with the dry end towards the stove or radiator. More moisture may be supplied from time to time, if necessary, through little holes punched in the bottom of the box. When examined after a day or two the roots will be found growing mainly towards the moist end of the box. The seeds may be partly germinated before putting them in the box.—GOODWIN D. SWEZEY, *Doane College, Crete, Nebraska.*

OPEN LETTERS.

A botanical "year-book."

Having read your editorial in the February number, I am quite of your opinion that an American compilatory work like that of Just would be of great value to botanists, but too extensive for the GAZETTE. But you could do a very good work by giving short annual summaries of the new species and genera published in America, with references indicating place of publication and habitat, as has been done since the close of 1885 by the British *Journal of Botany*. Every year there need be only a few pages, but they would be of high value to systematic botanists. It will thus become a necessary local and permanent continuation of the gigantic work now in preparation at Kew. Of course the first summary ought to include five years, beginning with the close of 1885.

Leipzig. OTTO KUNTZE.

Collections of weeds.

After a large correspondence, the question, what are our worst weeds, seems fairly well answered for all portions of our country. It is now my intention to issue sets of the worst hundred of these pests of the farm and garden, to be followed in the near future by parallel collections of the seeds of the same species. In an extended labor of love, as this is, the writer feels justified in asking all botanists and others who look with favor upon the enterprise, to kindly express by postal card their approval or more substantial words of encouragement. The collection, while more particularly designed for the botanists, horticulturists and agriculturists of the agricultural colleges and experiment stations, will, it is confidently hoped, fill a place in any herbarium not before occupied. The list of species will be made up from the scores of reports of botanists in all parts of the country upon *their* twenty worst weeds and will include the most pestiferous plants of the various regions of the United States. The price, not yet fixed upon, will be not far from eight dollars for the first century.

BYRON D. HALSTED.

Rutgers College, New Brunswick, N. J.

NOTES AND NEWS.

MESSRS. ELLIS and Everhart write about an interesting Coprinus, in the *Microscope* for May, which forms sclerotia. It was found by Mr. F. W. Anderson in Montana.

ONE HUNDRED new species of North American fungi are described by Messrs. Ellis and Everhart in the Proceedings of the Philadelphia Academy of Sciences for July. They are mostly pyrenomycetous forms.

A REVIEW of the works on lichenography appearing in 1889 is given by M. l'abbé Hue, and a similar notice of papers on vegetable anatomy by M. Leclerc du Sablon in a recent number of the Revue général de Botanique (ii. 404, 412).

HENRY L. BOLLEY, assistant botanist in the Indiana Experiment Station for the last two years, has gone to Fargo to assume charge of the botanical work in the North Dakota University and Experiment Station, recently organized.

HERBERT J. WEBBER, for some time assistant in the botanical department of the University of Nebraska, and author of the Flora of Nebraska recently published, has been appointed assistant in the Shaw School of Botany at St. Louis.

PROF. C. R. BARNES has been entrusted with the revision of Dr. Gray's Field, Forest and Garden Botany. The work will be extended to include the range of States west of the Mississippi, Tennessee and the higher portions of the Southern States. It is expected that the revision will be completed by the close of 1891.

A DESCRIPTIVE account of the Ustilagineæ of Denmark has been published by E. Rostrup in the *Festkrift udgivet af den botaniske Forening* in Copenhagen, 1890 (pp. 117–168). Twelve genera and sixty seven species are given, with four genera and seven species of the closely-related Protomyces group.

AN ADMIRABLE ARTICLE on the domain and condition of vegetable pathology in America, by B. T. Galloway, appeared in the *American Garden* for October. It treats an important subject in a comprehensive and incisive manner, and should be productive of its better understanding by the general public to whom it is addressed.

DR. J. T. ROTHROCK has arranged a biological expedition to the West Indies and Yucatan, to spend the months of November, December and January in those countries. The party is provided with an excellent ship, furnishing abundance of storage room for each, and is limited to eight. Mr. A. S. Hitchcock goes with the company in the interest of the Missouri Botanical Garden.

IN AN ARTICLE on the tannin of Compositæ (Rev. gén. de Bot. ii. 391) M. Lucien Daniel concludes that the greatest quantity of astringent substances is to be found in the leaves; after them in the order of their richness in these substances are the capitula, the stems, and, lastly, the roots. Young roots are less rich in tannin than mature ones, but the reverse is true of stems. The species of Cynarocephalæ are richest in tannin; the Cichoriaceæ are poorest. The tannin does not play the rôle of a reserve food.

THE DUTCH SOCIETY of Sciences at Haarlem invite research on a wide range of subjects, including the following: Methods of obtaining and fixing new varieties in cultivated plants; rôle of bacteria in filtration of potable waters through a layer of sand; bacteria and azotized combinations in the soil; healing after grafting.

THE THIRD annual meeting of the Western Society of Naturalists was held at Purdue University, La Fayette, Ind., November 12 and 13. The president, Dr. Chas. E. Bessey, could not be present, but his address upon the relation of scientific training to general culture was read. The discussions of the meeting were chiefly devoted to the subject of the presidential address, the kind and amount of scientific training to be required for entrance to college, the relation between investigation and instruction, and matters of technique, such as the exhibition or description of apparatus, imbedding, clearing, and staining processes, etc. Prof. C. R. Barnes acted as president, with Dr. J. S. Kingsley as secretary and Prof. Stanley Coulter as treasurer. The next annual meeting will be held at St. Louis, with the following officers: Prof. John M. Coulter, president; Prof. C. W. Hargitt, vice-president; Dr. J. S. Kingsley, secretary; Prof. B. P. Colton, treasurer.

DR. JULIUS WIESNER propounds in the Berichte der deutschen botanischen Gesellschaft (viii. 196) an entirely new theory of the construction and growth of the cell wall. Starting with the premises that within the organism living material arises only from living, or under the direct action of living material, and that there is no other mode of origination (Neubildung) in the organism except division, he argues that it follows as a logical necessity that the protoplasm, which is a very complex structure, can only reproduce itself by division. From this it follows that the living substance of plants (in which he would include the growing cell wall) must consist of minute organized individual particles which have the power to divide, to grow and to assimilate. These simplest elementary organs of the cell he designates *plasomes*. These plasomes are aggregated to form the organs of the cell in very much the same way as cells are aggregated to form tissues. The growth of any part of the cell is dependent on the production of new plasomes by division and on the growth in mass of each plasome, which he refers to the physical laws of diffusion and absorption, and to the subsequent assimilation of the materials so gained. The tensions in the cell are set up during the growth in volume of the cell, just as they are in organs composed of cells, by the unequal growth of certain parts. So, for instance, the tension of the cell wall is due to the collective pressure of the cytoplasm. "As the molecule is the last form-element of the dead substance, so the plasome forms, according to my conception, the last form-element of the organism possessing the attributes of life." Dr. Wiesner promises a more complete exposition of his theory in a future publication.